



Comparative Study of Effects of Maitland Technique and Mulligan Technique in Adhesive Capsulitis of Shoulder

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ABSTRACT

Background: Adhesive capsulitis is a painful condition and makes functional disability as a result of the limited range of motion (ROM) of the shoulder girdle. Various treatments, including mobilization and manipulation techniques have been advocated for restoration of a pain-free state and to restore the functional activity of upper extremity. Application of manual therapy may produce the good improvement in case of adhesive capsulitis shoulder. There is a need to compare the effects of Maitland and Mulligan techniques on various parameters in adhesive capsulitis of the shoulder. **Objective:** To evaluate the effects of Maitland technique and Mulligan technique in adhesive capsulitis of shoulder. **Methods:** The study population consisted of patients diagnosed as adhesive capsulitis. Visual analogue scale and other parameters were measured at baseline and at 3 weeks of intervention as per group allotment. **Results:** Mulligan and Maitland mobilization improved exercise performance significantly, while it is known that trust technique imposed by this technique is low. Mean improvements in ROM exceeded in the group received by Mulligan group. **Conclusion:** There is significant improvement in and coracohumeral ligament (CHL) and Human leukocyte antigen (HLA) B27 (HLA-B27) following 4 weeks of Mulligan and Maitland mobilization training for adhesive capsulitis.

Keywords: Adhesive capsulitis, Visual analogue scale, Range of motion, Mulligan, Maitland

INTRODUCTION

Adhesive capsulitis leads to pain and functional limitation as a result of the limited range of motion (ROM) of the shoulder girdle [1]. Although the natural history of adhesive capsulitis is not completely understood [2], patients experience the following stages of the sufferings; a freezing or painful stage, followed by stiffness, frozen or transitional phase and finally a thawing phase characterized by increased ROM [3,4]. The treatments advocated for adhesive capsulitis include rehabilitation as the initial conservative measure, anti-inflammatory drugs, intra-articular corticosteroids, capsular distension injections and surgical interventions in refractory cases. Various treatments, including mobilization and manipulation techniques have been advocated for restoration of a pain-free state and normal use of the upper extremity.

Manual and manipulative treatment options for this condition include high-velocity, low amplitude manipulation, end-range mobilization, mid-range mobilization and mobilization with movement of the shoulder only and/or of the shoulder girdle [5]. The rehabilitative interventions performed depend on the institution. The optimal use of common physical therapies and the frequency and timing of session criteria have not been established. Mulligan's technique for peripheral joints combines sustained manual application of gliding force to a joint, with the aim of repositioning bone positional false with concurrent physiological (osteo-kinematics) motion of the joint either performed actively by the subject or passively by the therapist [6]. It has been shown, the Mulligan technique can produce concurrent hypoalgesic effects during and following its application, as well as altering sympathetic nervous system function [7].

Adhesiveness increases the cross-link structures of the collagens in the shoulder joint capsules, tightness of the capsules, tightness of the coracohumeral ligament and inferior glenohumeral ligament. Limitation of the movements of the supraspinatus tendon will present. As well as increase the HLA-B27 in serological level. Adhesive capsulitis shoulder presents the tight capsules of the joint and thickening of the CHL [19,20], having HLA-B27 marker in

their serology [8,10]. Measurement of shoulder joint ROM by goniometric is a valuable diagnostic tool [15-17]. Maitland technique [11,13] and Mulligan technique [1,11] may provide good improvement than the usual usage of physiotherapy modalities compares the effect of Maitland technique and Mulligan technique to reduce the pain, improve the range of motion (ROM), changes in coracohumeral ligament (CHL) thickness and HLA-B27 in adhesive capsulitis of shoulder. The objectives of this study were to determine the effect of Maitland technique and Mulligan technique on reducing pain, improving ROM in subjects with adhesive capsulitis of shoulder and to determine the effect on CHL thickness and HLA-B27 status in subjects with adhesive capsulitis of the shoulder.

METHODOLOGY

Sample Design

Randomized single-blinded controlled clinical trial.

Ethical Considerations

Patients were included in the study after signing informed consent and randomly assigned to Group A and Group B and Group C.

Inclusion Criteria

- Males and females with adhesive capsulitis of the shoulder.
- Age group between 40 and 60 years (control diabetic group ($\text{HbA1C} \leq 7$)).
- Ability to understand and provide informed consent for participation in the study.
- Pain more than 3 months.

Exclusion Criteria

- Any other soft tissue injury around the shoulder.
- Fracture of shoulder complex bones.
- Malignancy around the shoulder.
- Medications for pain relief.

Assessment Parameters

The following parameters were measured at baseline and at 3 weeks.

- Visual analogue scale to measure pain
- The range of motion (ROM) by universal goniometer
- CHL (coracohumeral ligament)
- Human leukocyte antigen (HLA) B27 (HLA-B27)

Study Protocol

This randomized single blinded controlled clinical trial was conducted in Physiotherapy OPD, Saveetha Medical College and Hospital, Chennai and Ravi Diagnostic & Physiotherapy Centre, Chennai, India. Samples were allocated into two experimental and one control groups. Initially, the pilot study was done with 20 samples. The present study was done with 105 samples, 35 in each group by a sampling technique of closed envelope method.

Males and females of age between 40 to 60 years with adhesive capsulitis of shoulder suffering from pain more than 3 months with control diabetic group ($\text{HbA1C} \leq 7$) were included. Informed consent for participation was obtained from the patients and included in this study. Those who had fracture and any other soft tissue injury around shoulder and malignancy around shoulder and those who were taking medications for pain relief were excluded.

The study hypothesis stated that there will be no significant effect of Maitland and Mulligan technique in subjects with adhesive capsulitis of the shoulder. The ethical committee considerations include getting informed consents after explaining the whole procedure, risk, and benefits of the study to the participants, maintain privacy, not disclosing the subject's medical records and safety was closely watched through out the study. Translation of the information sheet

and the informed consent to the local language (Tamil) was done by the researcher and co-researchers. After getting approval from the Institutional Human Ethics Committee of Saveetha University, the study was initiated.

Group A: Experimental Group

Intervention - Experimental Groups

Group A: Hot pack + Maitland + ROM exercise

This group underwent initially hot pack application followed by Maitland and range of motion exercises.

Group B: Hot pack + Mulligan + ROM exercise

This group underwent initially hot pack application followed by Mulligan and range of motion exercises.

Intervention: Control Group

Group C: Hot pack (HP) + ROM exercise only

This group underwent initially hot pack application followed by a general range of motion exercises.

Data Analysis

One-way ANOVA (SPSS version 18) was used to test the various parameters. ANOVA, post-hoc tests, multiple comparisons test, and Tukey's HSD test were applied.

RESULTS

Various parameters were tested using one way ANOVA (SPSS version 18) shown below in Table 1 and Table 2 (Figures 1-12).

Table 1 One-way ANOVA used to test the various parameters and their values

| | | Sum of Squares | df | Mean Square | F | P-value |
|-------------|----------------|-----------------------|-----------|--------------------|----------|----------------|
| SN | Between Groups | 85750 | 2 | 42875 | 408.333 | 0.00 |
| | Within Groups | 10710 | 102 | 105 | | |
| | Total | 96460 | 104 | - | | |
| ROM_LR_pre | Between Groups | 13.333 | 2 | 6.667 | 0.18 | 0.835 |
| | Within Groups | 3770 | 102 | 36.961 | | |
| | Total | 3783.333 | 104 | - | | |
| ROM_LR_post | Between Groups | 3695.714 | 2 | 1847.857 | 53.243 | 0.00 |
| | Within Groups | 3540 | 102 | 34.706 | | |
| | Total | 7235.714 | 104 | - | | |
| ROM_AB_pre | Between Groups | 103.333 | 2 | 51.667 | 0.519 | 0.597 |
| | Within Groups | 10160 | 102 | 99.608 | | |
| | Total | 10263.333 | 104 | - | | |
| ROM_AB_post | Between Groups | 13249.048 | 2 | 6624.524 | 64.37 | 0.00 |
| | Within Groups | 10497.143 | 102 | 102.913 | | |
| | Total | 23746.19 | 104 | - | | |
| VAS_Pre | Between Groups | 0.305 | 2 | 0.152 | 0.2 | 0.819 |
| | Within Groups | 77.543 | 102 | 0.76 | | |
| | Total | 77.848 | 104 | - | | |

| | | | | | | |
|----------------|----------------|---------|-----|--------|-------|-------|
| VAS_Post | Between Groups | 104.286 | 2 | 52.143 | 85 | 0.00 |
| | Within Groups | 62.571 | 102 | 0.613 | | |
| | Total | 166.857 | 104 | - | | |
| CHL_ThicK_Pre | Between Groups | 0.014 | 2 | 0.007 | 0.096 | 0.909 |
| | Within Groups | 7.602 | 102 | 0.075 | | |
| | Total | 7.617 | 104 | - | | |
| CHL_ThicK_Post | Between Groups | 3.233 | 2 | 1.617 | 21.65 | 0.00 |
| | Within Groups | 7.617 | 102 | 0.075 | | |
| | Total | 10.85 | 104 | - | | |

Table 2 Multiple comparison using post-hoc test

| Dependent Variable | (I) Group | (J) Group | Mean Difference (I-J) | Std. Error | p-value | 95% Confidence Interval | |
|--------------------|-----------|-----------|-----------------------|------------|---------|-------------------------|-------------|
| | | | | | | Lower Bound | Upper Bound |
| SN | A | B | -35.000* | 2.449 | 0.00 | -40.83 | -29.17 |
| | | C | -70.000* | 2.449 | 0.00 | -75.83 | -64.17 |
| | B | A | 35.000* | 2.449 | 0.00 | 29.17 | 40.83 |
| | | C | -35.000* | 2.449 | 0.00 | -40.83 | -29.17 |
| | C | A | 70.000* | 2.449 | 0.00 | 64.17 | 75.83 |
| | | B | 35.000* | 2.449 | 0.00 | 29.17 | 40.83 |
| ROM_LR_pre | A | B | 0.857 | 1.453 | 0.826 | -2.6 | 4.31 |
| | | C | 0.571 | 1.453 | 0.918 | -2.89 | 4.03 |
| | B | A | -0.857 | 1.453 | 0.826 | -4.31 | 2.6 |
| | | C | -0.286 | 1.453 | 0.979 | -3.74 | 3.17 |
| | C | A | -0.571 | 1.453 | 0.918 | -4.03 | 2.89 |
| | | B | 0.286 | 1.453 | 0.979 | -3.17 | 3.74 |
| ROM_LR_post | A | B | -8.714* | 1.408 | 0.00 | -12.06 | -5.36 |
| | | C | 5.714* | 1.408 | 0.00 | 2.36 | 9.06 |
| | B | A | 8.714* | 1.408 | 0.00 | 5.36 | 12.06 |
| | | C | 14.429* | 1.408 | 0.00 | 11.08 | 17.78 |
| | C | A | -5.714* | 1.408 | 0.00 | -9.06 | -2.36 |
| | | B | -14.429* | 1.408 | 0.00 | -17.78 | -11.08 |
| ROM_AB_pre | A | B | -1.286 | 2.386 | 0.852 | -6.96 | 4.39 |
| | | C | 1.143 | 2.386 | 0.881 | -4.53 | 6.82 |
| | B | A | 1.286 | 2.386 | 0.852 | -4.39 | 6.96 |
| | | C | 2.429 | 2.386 | 0.567 | -3.25 | 8.1 |
| | C | A | -1.143 | 2.386 | 0.881 | -6.82 | 4.53 |
| | | B | -2.429 | 2.386 | 0.567 | -8.1 | 3.25 |
| ROM_AB_post | A | B | -16.714* | 2.425 | 0.00 | -22.48 | -10.95 |
| | | C | 10.571* | 2.425 | 0.00 | 4.8 | 16.34 |
| | B | A | 16.714* | 2.425 | 0.00 | 10.95 | 22.48 |
| | | C | 27.286* | 2.425 | 0.00 | 21.52 | 33.05 |
| | C | A | -10.571* | 2.425 | 0.00 | -16.34 | -4.8 |
| | | B | -27.286* | 2.425 | 0.00 | -33.05 | -21.52 |
| VAS_Pre | A | B | 0.114 | 0.208 | 0.848 | -0.38 | 0.61 |
| | | C | 0 | 0.208 | 1.00 | -0.5 | 0.5 |
| | B | A | -0.114 | 0.208 | 0.848 | -0.61 | 0.38 |
| | | C | -0.114 | 0.208 | 0.848 | -0.61 | 0.38 |
| | C | A | 0 | 0.208 | 1.00 | -0.5 | 0.5 |
| | | B | 0.114 | 0.208 | 0.848 | -0.38 | 0.61 |

| | | | | | | | |
|----------------|---|---|---------|--------|-------|--------|--------|
| VAS_Post | A | B | 1.429* | 0.187 | 0.00 | 0.98 | 1.87 |
| | | C | -1.000* | 0.187 | 0.00 | -1.45 | -0.55 |
| | B | A | -1.429* | 0.187 | 0.00 | -1.87 | -0.98 |
| | | C | -2.429* | 0.187 | 0.00 | -2.87 | -1.98 |
| | C | A | 1.000* | 0.187 | 0.00 | 0.55 | 1.45 |
| | | B | 2.429* | 0.187 | 0.00 | 1.98 | 2.87 |
| CHL_ThicK_Pre | A | B | 0.0286 | 0.0653 | 0.9 | -0.127 | 0.184 |
| | | C | 0.0143 | 0.0653 | 0.974 | -0.141 | 0.17 |
| | B | A | -0.0286 | 0.0653 | 0.9 | -0.184 | 0.127 |
| | | C | -0.0143 | 0.0653 | 0.974 | -0.17 | 0.141 |
| | C | A | -0.0143 | 0.0653 | 0.974 | -0.17 | 0.141 |
| | | B | 0.0143 | 0.0653 | 0.974 | -0.141 | 0.17 |
| CHL_ThicK_Post | A | B | 0.2429* | 0.0653 | 0.001 | 0.087 | 0.398 |
| | | C | -0.1857 | 0.0653 | 0.015 | -0.341 | -0.03 |
| | B | A | -0.2429 | 0.0653 | 0.001 | -0.398 | -0.087 |
| | | C | -0.4286 | 0.0653 | 0.00 | -0.584 | -0.273 |
| | C | A | 0.1857* | 0.0653 | 0.015 | 0.03 | 0.341 |
| | | B | 0.4286* | 0.0653 | 0.00 | 0.273 | 0.584 |

*The mean difference is significant at the 0.05 level

Group A Lateral Rotation ROM Pre and Post

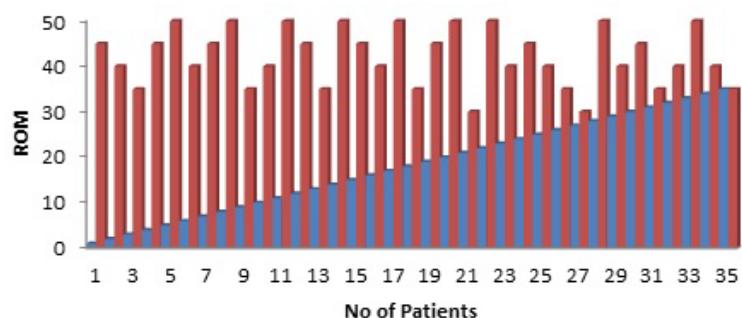


Figure 1 Difference in lateral rotation ROM for Group A

Group B Lateral Rotation ROM Pre and Post

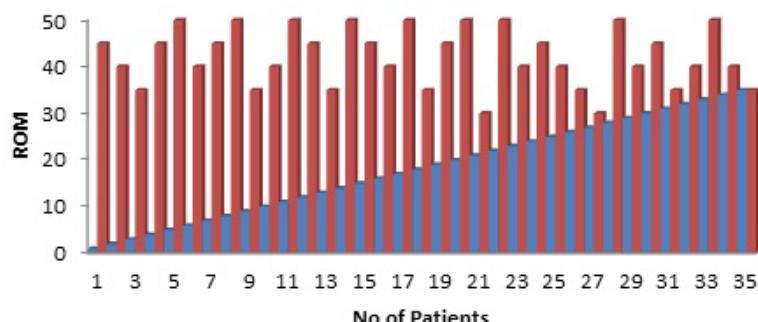


Figure 2 Difference in lateral rotation ROM for Group B

Group C Lateral Rotation ROM Pre and Post

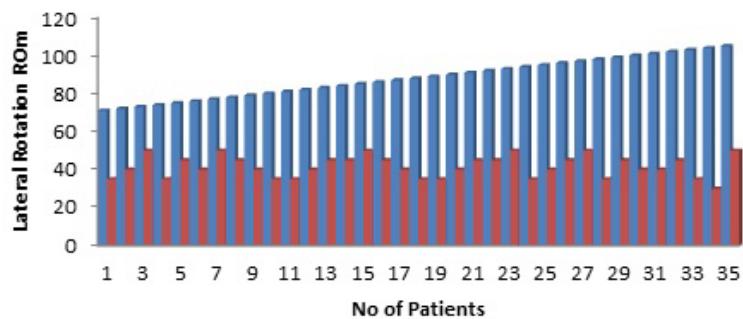


Figure 3 Difference in lateral rotation ROM for Group C

Group A Abduction ROM Pre and Post

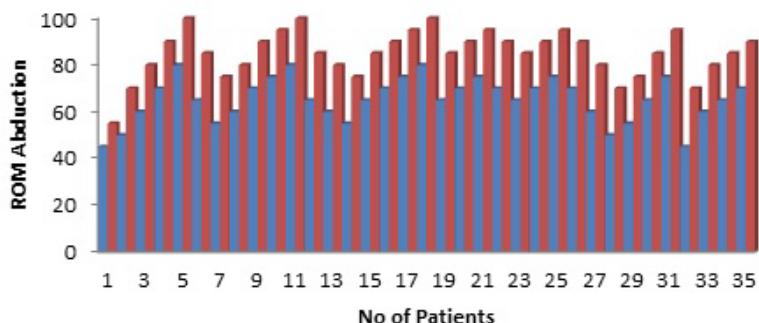


Figure 4 Difference in abduction ROM for Group A

Group B Abduction ROM Pre and Post

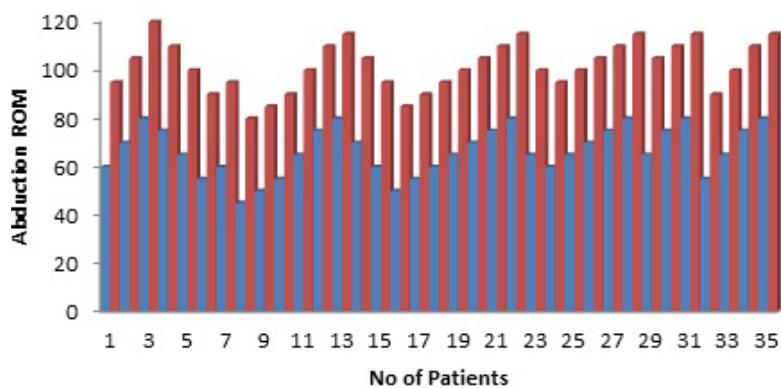


Figure 5 Difference in abduction ROM for Group B

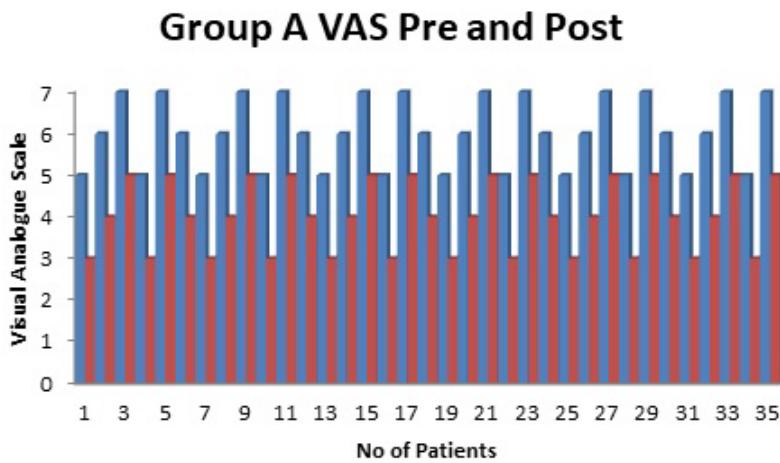


Figure 6 Difference in abduction ROM for Group C

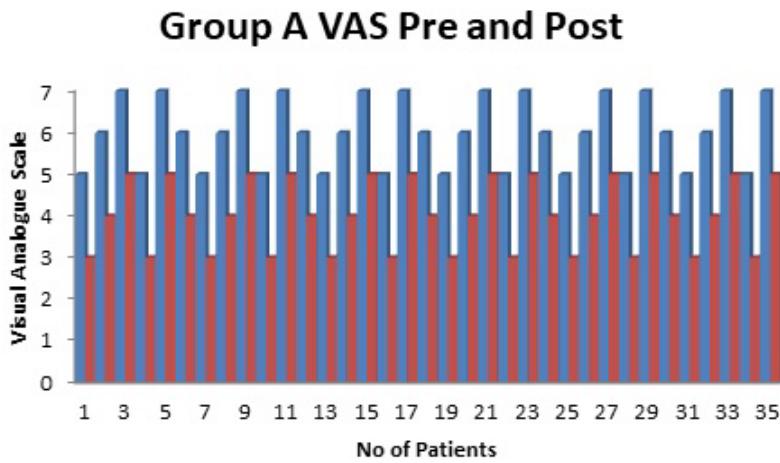


Figure 7 Difference in VAS for Group A

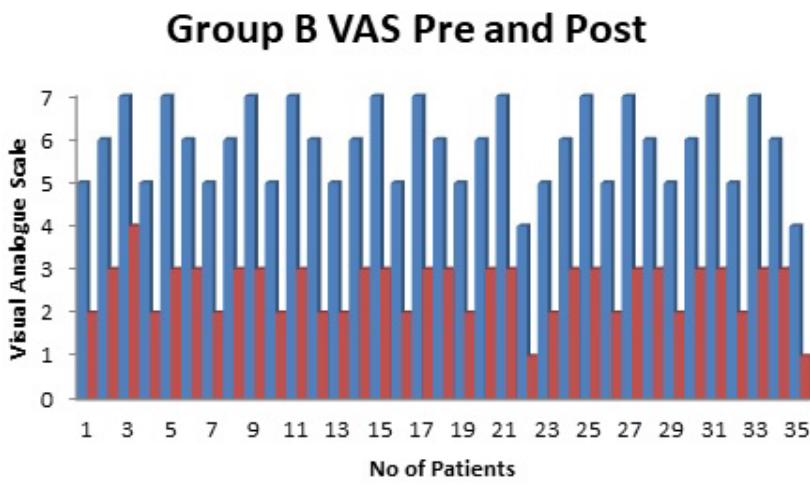


Figure 8 Difference in VAS for Group B

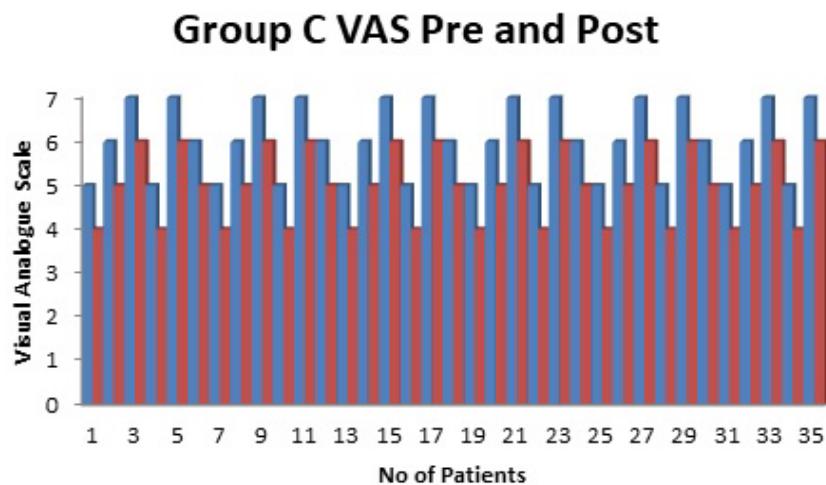


Figure 9 Difference in VAS for Group C

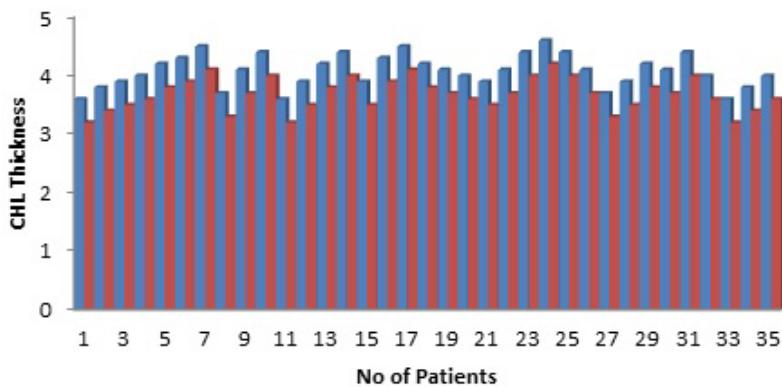
Group A CHL Thickness Pre and Post

Figure 10 Difference in CHL thickness for Group A

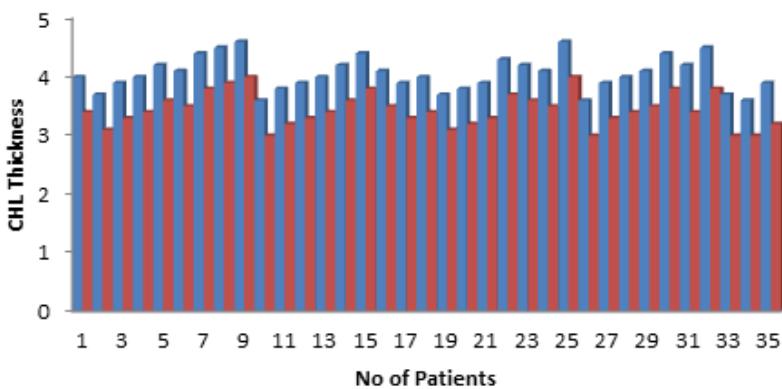
Group B CHL Thickness Pre and Post

Figure 11 Difference in CHL thickness for Group B

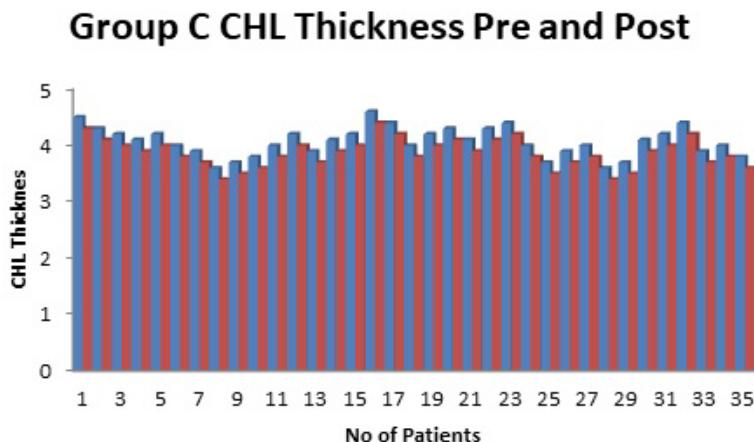


Figure 12 Difference in CHL thickness for Group C

DISCUSSION

The present study was done to evaluate effectiveness of the two manual techniques, i.e. Mulligan (MWM) and Maitland mobilization technique along with hot pack application and exercises on the adhesive capsulitis of the shoulder joint, and also to compare which of the techniques is better in terms of reducing pain, improving functional range of motion and the joint mobility in relation to CHL and HLA-B27. All the participants have received the intervention for a period of 4 weeks, following which the mobilizations were discontinued and patients were put on a home exercise program. The pain relief was positive on both the groups. Statistically significant difference was shown in between both the groups. When the responses were compared between the groups, the result showed significant difference at 4 weeks of intervention, which means that Maitland is better than Mulligan in relieving the pain. The present study shows there was a significant difference in the scapula humeral rhythm at follow-up in both the groups. Maitland and Mulligan techniques are effective in increasing the range of motion in patients with adhesive capsulitis. Both the groups on follow up shows the functional improvement and achievement of range of motion. Extension and internal, external rotation range of motion has shown maximal improvement in between the groups received Maitland and Mulligan techniques. The improvement in the range of motion was seen in almost all the ranges within both the groups from baseline to follow-up. This pattern was similar in both the groups. In the Maitland group, except the extension and internal rotation, flexion, abduction, and external rotation ranges improved post intervention. In the Mulligan group, the improvement in the ranges was significant for flexion, extension, abduction, and external rotation. The improvement in the Mulligan group, can be attributed to the corrective glide to achieve optimal alignment of the articular surfaces and its maintenance by appropriate recruitment of the muscles by patients' active efforts.

CONCLUSION

Maitland technique and Mulligan technique may provide good improvement than the usual usage of physiotherapy modalities both the techniques are effective in reducing the pain, improve the range of motion (ROM), significant changes in coracohumeral ligament (CHL) thickness and HLA-B27 in adhesive capsulitis of the shoulder.

DECLARATIONS

Conflict of Interest

The authors have disclosed no potential conflicts of interest, financial or otherwise.

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